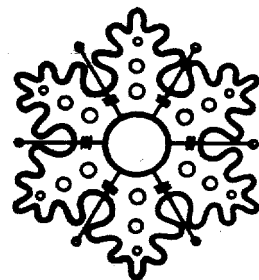


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THE FUNCTION OF THE SWISS WATCHMAKING RESEARCH LABORATORY



SCIENCE IN THE SERVICE

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The modern age demands modern methods. There was a time when the hand of the watchmakers was guided only by tradition and by rule-of-thumb. The age of technical achievement has challenged the watch industry to produce work of ever greater precision—and has placed it in a position to do so. The Watchmaking Schools have come into being as a result of a new outlook in the field of vocational training, and also as a result of production requirements. Yesterday the watch industry found itself obliged to give up its long-accepted routine and think in terms of technics. To-day the march of progress is compelling it to revise its ideas of the factor "brain" in the watch industry, and to ally technics from now on with science, in the service of the customer.

Yesterday we had the family workshop, where the master workman taught "everything" to the apprentice. To-day we have the big factory, the works, for which the Watchmaking Schools train department heads and skilled workers.

Switzerland has, besides, a laboratory intended to contribute that extra knowledge from which all power flows in this day and age: Science. What follows is an attempt to define the functions of the Swiss Watchmaking Research Laboratory in Neuchâtel.

The Director of the Laboratory has been good enough to describe the part it plays and give us some indications as to the circumstances which led to its creation, and the work it is doing.

The Swiss Watchmaking Research Laboratory is a connecting link between science and industry. Mr. A. Jaquerod, former director of the Swiss Watchmaking Research Laboratory, recognized the need for this link between the ideas of the mind, their translation into scientific experiment and their daily application in the appropriate branches of the watch industry, more than thirty years ago, for he recommended the creation of a watchmaking research laboratory in 1919, when he was installed as Rector of the University of Neuchâtel. While the idea was quite favourably received from the first in watchmaking circles, its realization was

a slow and laborious process. The laboratory began its work on 1 August 1921, in damp, dark premises in the basement of the University of Neuchâtel, all that could be made available at that time to an institution which has now become indispensable to the Swiss watch industry. The Laboratory compelled recognition for itself at once, however, by the usefulness of its work and the new impetus it succeeded in giving to chronometrical science. At the same time the teaching in the different watchmaking Schools was standardized, and the curriculum was given an experimental bias.

Nineteen twenty-four was the year of the creation in Switzerland of the great watchmaking organizations which were subsequently to make an important contribution to the economic organization of the watch industry and give the Laboratory the assistance it needed for its development. We need only mention here that the year 1924 also saw the creation of a Swiss Watchmaking Research Laboratory Association, with the following aims:

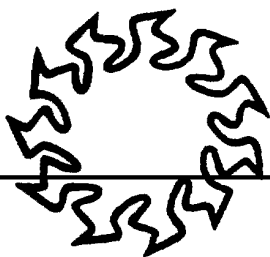
To carry out research with a view to its practical application, either in the general interest or at the request of manufacturers or other persons;

to supply information and make available to interested persons the most extensive scientific documentation possible;

to check, on request, the measuring apparatus used by the manufacturers;

to act as a link between the watchmaking industry and the University of Neuchâtel with a view to the creation and maintenance of advanced watchmaking courses.

A foundation established by the Fédération suisse des associations de fabricants d'horlogerie (F.H.), the Chambre suisse de l'horlogerie, Ebauches S. A., the UBAH and the Asuag, undertook to collect the funds required to build a magnificent laboratory, which was officially opened on 30 November 1940. So much work is done by the Swiss Watchmaking Research Laboratory that an extension had to be planned, and the institution now has two buildings. It is worth mentioning, before going on to describe the work for which the Swiss Watchmaking Re-



OF THE WATCH INDUSTRY

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search Laboratory is responsible for the S.W.R.L. Association consists of collective members (cantons in the watchmaking area, official bodies, watchmaking associations with their headquarters in Switzerland) and individual members, either of Swiss nationality or domiciled in Switzerland. It is an interesting fact that the Swiss Watchmaking Research Laboratory is official and yet private.

Two kinds of work

The Swiss Watchmaking Research Laboratory deals with two kinds of work, namely: research done at the request of manufacturers, and general research relating to very varied fields: physics, mechanics, chemistry, etc. In 1925 the S.W.R.L. undertook 677 individual pieces of research (as against 586 in 1951). The number of calls now made upon the S.W.R.L. to solve the many problems of a scientific nature which arise in the industry are proof of the high regard in which it is held. So far the S.W.R.L. has solved more than six thousand five hundred individual problems, in addition to the general work it undertakes in the interest of the Swiss watchmaking economy as a whole.

For this work the S.W.R.L. has a highly trained staff with specialist qualifications in the various branches of science related to the watch industry. It is a significant point that in the general research carried out from the beginning by the S.W.R.L., the first scientific work was almost inevitably directed towards the problem of regulating watches. As everyone knows, temperature, atmospheric pressure, magnetic fields, jolting and vibration have a marked effect on the working of watches. The S.W.R.L. was not content simply to show the importance and establish the laws of variation of these disturbances; it suggested technical means for reducing their effects. A screen to protect the watch against magnetic fields was developed. The problem of the structural stability of hairsprings of the compensating type, the influence of barometric pressure on the working of watches were the subject of much research work. A study of the influence of the nature of the surrounding air on the period of oscillation of balance-wheels has also been made in the Laboratory.

Among other questions dealt with, we may also mention problems relating to the tensility and internal friction of metals, the isochronism of oscillations, the functions of the escapement, the friction and lubrication of moving bodies. In this connection the S.W.R.L. has developed a synthetic oil, which is now obtainable on the market and has been well received.

Although the problem of regulating watches and other problems directly related to it claimed the attention of those in charge of the S.W.R.L. from the beginning, that did not prevent them from studying other questions as well—far from it. The man of science rightly believes that the making of a watch does not depend entirely on the manual dexterity of the workman, or on the technical perfection of the pattern designed by the technician, but also on the physical and mechanical properties of the raw materials used.

That explains why the scientific field covered by the investigations of the S.W.R.L. scientists (either individual pieces of research or general work done by the scientists of the Laboratory) is practically

examples.

The Swiss Watchmaking Research Laboratory, equipped as it is to-day, is in a position to tackle any problems of metallography and studies of special alloys, besides the tensility of metals, the mechanical and thermic treatment of the alloys in question, tempering, the structural hardening of alloys, etc. The S.W.R.L. is equipped to do fusion in a vacuum of something like one hundred thousandth of a millimetre of pressure, a process which makes it possible to avoid any oxidization of the alloys during fusion and to eliminate completely occluded gases, which in some cases have a considerable effect on the mechanical and physical properties of alloys. Of course the S.W.R.L. also deals with the testing of materials, measuring their hardness, their tensile strength or their brittleness; it studies the quality of watch stones, the effect of acids on surface condition and behaviour of oils. Galvanoplasty constitutes yet another branch of the Laboratory's work, and one through which it has proved possible to effect considerable improvements in scouring baths and the composition of galvanic baths. Corrosion phenomena also make a claim on the attention of scientists, as the products of the watchmaking industry intended for tropical countries are more susceptible than others to external influences.

A special field in which the S.W.R.L. is working is the study of radioactive luminous substances. The Laboratory has helped to improve the quality of these substances and has developed special methods by which their radioactivity and variations in luminosity due to the weather can be measured. Apart from these purely scientific problems, the Swiss Watchmaking Research Laboratory carries on other work with a more direct bearing on the manufacture of watch parts. Here again we shall content ourselves with only a few examples: the testing of manufacturing callipers, which have to be checked to within $\frac{1}{10}$ of a micron (one ten-thousandth of a millimetre), the testing of observation measuring instruments used by the manufacturers, micrographical examinations which the manufacturers cannot carry out themselves.

Some special studies have led on to general research work, e.g. the study of the burnishing of dials, the «crackling» of organic glasses, the deterioration of certain kinds of gold plating.

If the explanation of a defect is discovered, the whole Swiss watchmaking industry benefits by the discovery, since it is communicated to the industry either in a publication or, more generally, in one of the lectures given every year to watchmaking technicians and attended by some five hundred of them.

Similarly, the S.W.R.L. will give manufacturers the formulas for scouring baths, etc.

Finally, it can be said that the Swiss Watchmaking Research Laboratory has given a new impetus to the science of chronometry by stimulating a greater interest in scientific methods and by helping to create University courses for watchmaking technicians.

Watchmaking engineers

In collaboration with the Swiss Watchmaking Research Laboratory the University of Neuchâtel has introduced a degree in watchmaking, which

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can only be obtained by students of Swiss nationality who hold the watchmaking technician's diploma of a Swiss watchmaking school and are approved by the Office of the Board of Management of the Swiss Watchmaking Research Laboratory. The course is a three-year one and includes classes in physics, chemistry, metallography, the theory of material testing, mathematics, electricity, astronomy applied to chronometry, etc. A considerable part of the future watchmaking engineer's studies will consist of laboratory work in the following subjects: physics, chemistry, micrography, design, chronometry, metallography.

The thoroughness of these studies is a good indication of the attitude of the responsible circles of the Swiss watchmaking industry towards the training of those who will become, in private laboratories, the representatives of science applied to the everyday sphere of production. Trained with a special view to the application of scientific methods to watch design, and the development of chronometrical science in the practical field, watchmaking engineers will no longer be simply designers, but innovators who are to visualize and make ready the watches of to-morrow. The future watchmaking engineers receive a very advanced training in physics, electricity and electronics, because it is in that direction that the watch will evolve. Once they take up their posts in the heart of the industry and its concerns, they work in the same spirit as the scientists of the S.W.R.L.

A valuable institution

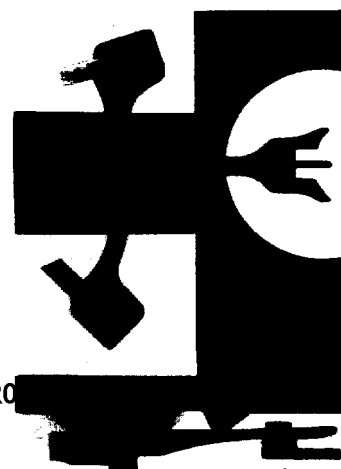
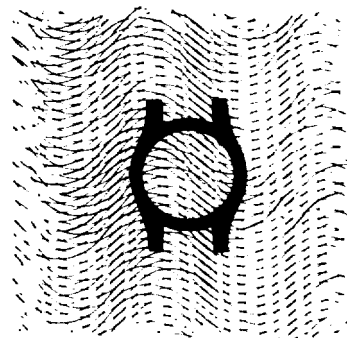
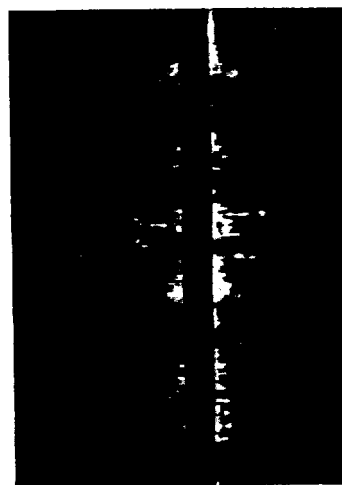
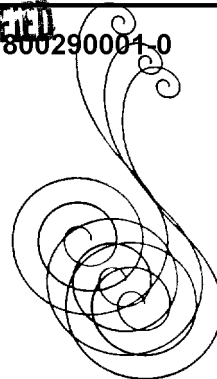
As we have indicated above, the manufacturers are making ever-increasing demands on the Swiss Watchmaking Research Laboratory.

The problems it is called upon to solve are as many as they are varied. We cannot list them all, but we believe we have given some idea of them. Thanks to modern equipment and often very costly apparatus, combined with the perfect organization of the laboratories, where a highly qualified staff can work in favourable conditions, the problems which could not be solved anywhere else find a solution at the S.W.R.L.

As for its pioneer work, the Swiss Watchmaking Research Laboratory proposes to go on with it faithfully, as it has done up to now, showing the way in many different fields. That is why a department dealing specially with electronic research has been created. The fundamental principles of electronic physics in relation to modern chronometry and kindred fields are the basis for the studies carried on by this department of the S.W.R.L.

In the Swiss Watchmaking Research Laboratory the Swiss watch industry has an institution on which it can rely for help in solving its scientific problems of the moment, but also, and perhaps still more, for the building of its scientific future, since Science is more closely linked than ever to Technics.

The Swiss Watchmaking Research Laboratory brings to the Swiss watchmaking industry in the field of science that support which the Watchmaking Schools give in the domain of manpower. That is one more reason why the Swiss watchmaking industry should look forward to the future with confidence.



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